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Notes on Examination of Urine.

NOTES ON

EXAMINATION OF URINE.

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BASED UPON PROF. JAMES TYSON'S "HANDBOOK FOR PRACTICAL EXAMINATION OF URINE." SIXTH EDITION.

In the examination of urine, the following are the steps found most convenient in actual practice. Observe:—

I. The quantity passed in twenty-four hours.
II. Color and transparency.
III. Odor.
IV. Reaction.
V. Specific gravity.
VI. Presence or absence of sediment, its quantity and character.
VII. Presence or absence of albumin.
VIII. Presence or absence of sugar.

Heat and Acid Test.

The best test for determining the presence of albumin in urine is heat corroborated by nitric acid. To apply this test, fill a test-tube one-fourth its depth with *perfectly clear urine*, to which, if it be not distinctly acid in reaction, *a drop or two* of acetic acid is added—only enough to make it clearly acid—and the fluid boiled over a spirit lamp. If an opacity results, the slightest degree of which becomes visible in a clear urine held in a good light, it is due either to *albumin* or *earthy phosphates*. If the latter, it promptly disappears on the addition of a few drops of nitric acid; *if albumin, it is permanent.*

Acetic acid is preferred to nitric for acidulating the urine, because not only is it true that a small quantity of albumin is dissolved by a large amount of nitric acid, but also that if a drop or two of nitric acid be added to a specimen of albuminous urine, so as to render it distinctly acid, it may happen, on boiling, that no precipitate will appear, although much albumin is present. This is because the serum-albumin is converted into acid-albumin or syntonin, which is not coagulated by heat.

The Nitric Acid Test.

This is best applied according to Heller's method. Upon a convenient quantity of pure, colorless nitric acid in a small test-tube, allow to trickle from a pipette, down the side of the inclined glass, an equal amount of clear urine, which will thus overlie the acid. If albumin is present, there appears at the point of contact between the urine and nitric acid a sharp white band or zone, of varying thickness, according to the quantity of albumin present.

Occasionally, a somewhat similar white zone is formed by the action of nitric acid on the mixed urates if present in excess, by which the more insoluble acid urates are thrown down. This zone might be mistaken for that of albumin, but the acid urates begin to appear, not so much at the border, between the urine and acid, as higher up; nor does the zone on its upper surface remain so sharply defined, but, while under examination, is seen to diffuse itself into the urine above. Further, the application of heat causes its immediate disappearance.

Rarely the urine is so concentrated that nitric acid forms crystals of nitrate of urea, which, however, are dissolved by the application of heat.

The Picric Acid Test.

Into a test-tube, about six inches long, pour a four-inch column of *clear, transparent* urine; then, holding the tube in a slanting position, pour gently an inch of a saturated solution of picric acid on the surface of the urine, where, in consequence of its low specific gravity (1005), it mixes only with the upper layer of the urine.

As far as the yellow color of the picric acid solution extends, the coagulated albumin renders the liquid turbid, contrasting with the transparent urine below. For the action of the test, *there must be an actual mixture*, and not a mere surface contact. When, in consequence of the scantiness of the albumin, the turbidity is very slight, the application of heat to the upper part of the turbid column increases it. Then, if the tube be placed in a stand, the coagulated albumin will gradually subside, and, in the course of an hour or so, forms a delicate, horizontal film at the junction of the colored and unstained stratum of urine. No previous acidulation of the urine is required, as the picric acid accomplishes this, if needed. Urates, peptones and vegetable alkaloids, like quinine, morphine, etc., are precipitated by picric acid from urine containing them, but it should be remembered that the application of a *moderate* amount of heat will dissolve the ring thus formed.

By Fehling's Solution.

Place a small quantity of Fehling's solution in a test-tube, and dilute it with about four times its bulk of distilled water, and then boil the mixture for a few seconds. If a precipitate occur, the test solution is worthless, and a fresh supply obtained. To the *boiling, diluted, fresh Fehling's solution* add the suspected urine, drop by drop, and if sugar is present, a yellowish or reddish-yellow precipitate, the suboxide of copper, appears. Whenever Fehling's solution shows the presence of sugar in the urine, this result should be corroborated by the application of the subnitrate of bismuth, or Bötger's test, as follows:—

Subnitrate of Bismuth Test.

Add to urine an equal quantity of liquor potassæ or sodæ and a pinch of ordinary subnitrate of bismuth, and boil; when, if sugar is present, the subnitrate is converted into the black metallic bismuth. If the quantity of sugar is small, the bismuth assumes a grayish hue.

Before applying either of the above tests, albumin, if present, should always be removed by the addition of acetic acid, boiling and filtration.

It should be remembered that occasionally uric acid, creatinin, etc., have the power of reducing Fehling's solution, and thus leading us to erroneously believe sugar to be present.

The Picric Acid and Potash Test.

To a fluid-drachm of suspected urine, add 40 minims of a saturated solution of picric acid and half a drachm of liquor of potassæ. Boil this mixture, and, if sugar is present, a dark, mahogany-red color will be produced.

For quantitative work, perhaps the fermentation test can be most easily applied by the physician.

Quantitative Determination of Sugar by the Fermentation Test.

Having taken the specific gravity of the urine, add a piece of compressed yeast about the size of a walnut, then place it in a warm place, about 80–90° F., for three or four hours, or until Fehling's solution shows no sugar. Allow the urine to cool to the original temperature, and again take the specific gravity. Multiply the number of degrees of specific gravity *lost* by .23, and the result is the percentage amount of sugar present